# The Olentangy River Wetland Research Park: Progress Report for 2001

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## Summary

*This publication offers the tenth consecutive annual report on teaching, research, service, and development at the Olentangy River Wetland Research Park (ORWRP). It covers progress in calendar year 2001, the eighth year of hydrologic operation of the two 2.5-acre experimental wetland "kidneys" on the site, and the fifth year of ecological development of our 7-acre mitigation wetland "billabong." Seventeen courses from 4 Colleges (FAES, MAPS, ENG, and BIOSCI) used the ORWRP in 2001 and 3 Master's theses and 1 Ph.D. from 3 professors were completed in 2001, raising the total number of theses and dissertations completed at the ORWRP to 35. Degrees have been from the interdisciplinary environmental science graduate program, natural resources, and engineering at OSU and from 3 different European institutions.*

*First-year funding for a contract from the U.S. Army Corps of Engineers to study the potential for restoration of Big Darby Creek was initiated in 2001 and grants and contracts totalling $2.4 million were active at the ORWRP in 2001. Approximately $250,000 in donations were generated in 2001, including a $75,000 donation of 5 acres of bottomland hardwood forest to the ORWRP and Ohio State. Two short courses on wetlands were taught to 44 consultants and agency personnel from 11 states in 2001, resulting in course fees of approximately $39,000.*

*Among the significant events related to ORWRP in 2001 were: 1) a fund-raising "kickoff" for the new wetland research and education building on February 2, 2001; 2) a formal groundbreaking for the building on May 11, 2001; 3) a scientific symposia in Chicago on May 31, 2001 entitled "The Olentangy River Wetland Research Park: Ten Years of Research on Wetland Functions" as part of the Society of Wetland Scientist's annual meeting; and 4) two "Moonlight on the Marsh" seminars, one in August and one in November. Ninety-three formal tours or presentations of the ORWRP were given in 2001 to over 1500 participants. Construction bids were received on December 13, 2001 for the Wetland Research and Education Building and were sufficiently low to allow, with a $330,000 loan from OARDC, construction of the entire building, sans furniture and fixtures, in 2002.*

## Why a Wetland Research Park?

Wetlands are shallow to intermittently flooded ecosystems that are more commonly known by such terms as swamps, bogs, marshes, and sedge meadows. They are revered as important parts of the natural landscape because of their functions in cleaning and retaining water naturally and in providing a habitat and food source for a wide variety of plant and animal species. It is estimated that more than half of the original wetlands in the lower 48 states have been lost to drainage projects and human development projects. Ohio has lost about 90 percent of its original wetlands.

When we lose wetlands, we lose their ability to provide clean water, prevent floods and enhance biological diversity. Many organizations are calling for construction of new wetlands to clean up our streams, rivers, and lakes. The National Academy of Sciences has called for the restoration and creation of 10 million acres of wetlands in the United States by the year 2010. Five million acres of wetlands have been suggested as being necessary to help prevent the dead zone or hypoxia in the Gulf of Mexico from the Mississippi River basin (Mitsch et al., 2001). The National Academy of Sciences also determined in 2001 that more research is needed before we can be assured that mitigation wetlands, those wetlands that are constructed to replace wetlands destroyed for development, can be successful. In order to solve such problems we need to know: 1) how wetlands work; 2) if we can create and restore them; and 3) the best approaches to creation and restoration of wetlands. The Olentangy River Wetland Research Park is designed to be a long-term, large-scale wetland research facility on a major college campus. There is no other facility of its kind on any other campus in the USA.

## Progress at OSU's Wetland Site

The Olentangy River Wetland Research Park is located on a 30-acre site owned by the Ohio State University, immediately north of Dodridge Road and adjacent to the Columbus campus (Figures 1 and 2). The site has been developed in three phases:

Phase 1 — Construction of two experimental wetland basins and their water delivery system;

Phase 2—Development of a research and teaching infrastructure at the site including boardwalks, experimental mesocosms, a plant-material greenhouse, additional wetlands, instrumentation for long-term research, and a visitor pavilion; and

Phase 3—Development and construction of a the Wetland Research and Education Building on the site.

Figure 1. Aerial photograph of Olentangy River Wetland Research Park, Ohio State University, August 2001.

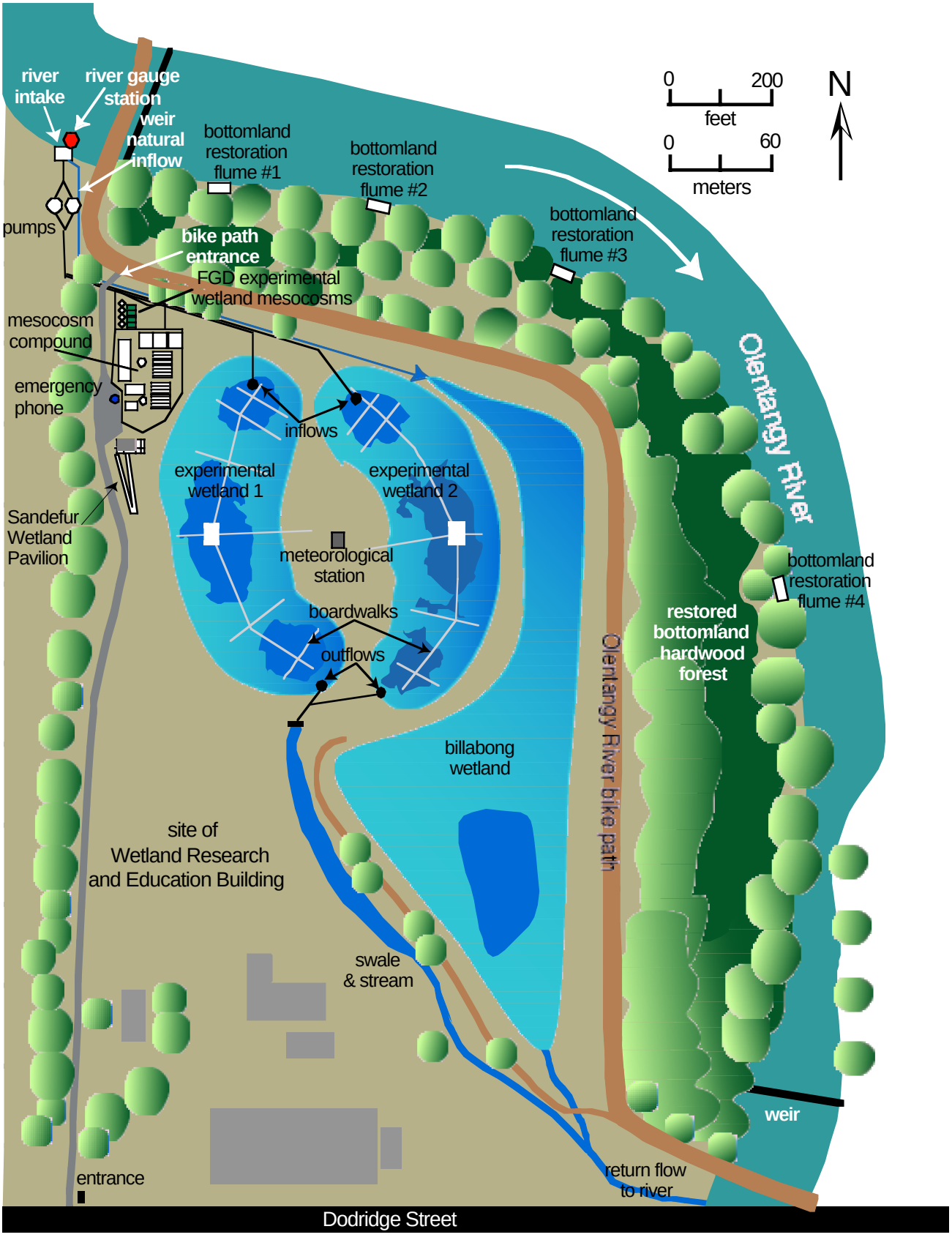


Figure 2. Status of of the Olentangy River Wetland Research Park at the end of 2001.

Phase 1 of site development, which featured construction of two 2.5-acre deepwater marshes and a river water delivery system, was completed in 1994. Pumps were installed on the floodplain to bring water from the Olentangy River to the wetlands and pumping officially began on March 4, 1994. River water is pumped continuously, day and night, into the two wetlands. It then flows by gravity back to the Olentangy River through a swale and constructed stream system. In May 1994, one wetland basin was planted with marsh vegetation typical of wetlands in the Midwest; the other remained as an unplanted control. This has become the major full-scale "experiment" at the site.

Phase 2, establishing the infrastructure for research and education of the site, began in 1994 and was completed in 1999 with the dedication of the Sandefur Wetland Pavilion.

Planning for Phase 3, the construction of the Wetland Research and Education Building at the ORWRP, began in earnest with the receipt of $1.18 million in 2 grants from the Ohio Board of Regents in 1999 and 2000 in their Hayes Investment Fund competition. The grants were the result of an effort of a 5-university consortium of Ohio institutions—Ohio State, Wright State, Shawnee State, Youngstown State, and Kenyon College. Activity to seek additional support for the building continued through 2001. An architectural firm was hired in 2000 and the final design and construction documents were completed in 2001. The building design was published for bids in fall 2001 and final bids were opened on December 13, 2001. Sufficient funds were available to build the facility and construction began in spring 2002. [Construction activity will be covered in the 2002 annual report.]

## Teaching, Research, and Service

### *Teaching*

On-site teaching in a "living laboratory" setting has been an emphasis at the Olentangy River Wetland Research Park since its inception. From the time that a Natural Resources graduate seminar class in 1991 helped to design the project, dozens of formal courses involving thousands of students have made use of the site annually for ecological or other learning related to wetlands, surrounding uplands or the river. These formal courses have included classes on wetland ecology, water quality, ecological engineering, anthropology, architecture, general chemistry, wildlife management, animal ecology, groundwater hydrology, ornithology, and forestry. Seventeen courses involving several hundred students formally used the site in 2001 (Table 1). In addition, the site is used annually for hundreds of hours of undergraduate and graduate research credit hours, e.g., 693 or 999. The site was also used by classes from Columbus State, Wright State, Capital University, and Kenyon College among others.

A total of 35 students have completed dissertations, master's theses, or honors undergraduate theses with partial or full use of the Olentangy River Wetland Research Park from 1992 through 2001 (Table 2). One Ph.D. and three master's theses were completed in 2001. While most students are from Ohio State departments, there have been 5 students from Europe (two from UK, three from Denmark) who collected thesis data at the ORWRP including Rikki Broennum, who completed her requirements in Denmark

Table 1. Formal class use of Olentangy River Wetland Research Park, 2001.

| Term | Course | Number of Students | Instructor |
|---|---|---|---|
| Winter 2001 | | | |
| | NR/FABE/CEE 618 Ecological Engineering Science | 50 | Bouchard, Granada, Martin |
| | LARCH 633 Plants in Design | 43 | Amidon |
| | NR 797B Wetland Restoration | 7 | Mitsch |
| Spring 2001 | | | |
| | LARCH 323 Landscape Architecture | 23 | Breeden |
| | LARCH 622 Landscape Architecture | 23 | Breeden |
| | EEOB 322 Introduction to Ornithology | 20 | |
| | NR 355 Water Quality Management | 35 | Cronk |
| | NR 622 Waterfowl Management | 50 | Gates |
| | Biology 111 Introduction to Biology (Columbus State) | 20 | Bailey |
| Summer 2001 | | | |
| | 175 Introduction to Biology Columbus State | 11 | Mort Javadi |
| | Women in Engineering Class (all day) | 50 | Weavers/Christy |
| Autumn 2001 | | | |
| | NR 725 Wetland Ecology and Management | 36 | Mitsch |
| | NR 355 Water Quality Management | 35 | Bouchard |
| | ART 273 Landscape Painting | 2 | |
| | EEOB 413 Ecology | 20 | Snow |
| | Chem 221 (Honors) Quantitative Chemical Analysis | 17 | Olesik |
| | EEOB 625 Mammalogy | 70 | Harder |

Table 2. Theses and dissertations completed at the Olentangy River Wetland Research Park through 2001.

*Ph.D. dissertations (9)*

• **Changwoo Ahn** "Ecological engineering of wetlands with a recycled coal combustion byprooduct" Ph.D. dissertation, Environmental Science Graduate Program (2001)
• **Michael A. Liptak** "Water column productivity, calcite precipitation, and phosphorus dynamics in freshwater marshes" Environmental Science Graduate Program (2000)
• **John J. Gutrich** "Ecological and economic analysis of natural capital: Assessing and modeling the substitutability of mitigation wetlands for natural sites" Environmental Science Graduate Program (2000)
• **Douglas J. Spieles** "Nutrient retention and macroinvertebrate community structure in constructed wetlands receiving wastewater and river water" Environmental Science Graduate Program (1998)
• **Randall J.F. Bruins** "Modeling of flooding response and ecological engineering in an agricultural wetland region of Central China" Environmental Science Graduate Program (1997)
• **Neal E. Flanagan** "Comparing ecosystem structure and function of constructed and naturally occurring wetlands: Empirical field indicators and theoretical indices" Environmental Science Graduate Program (1997)
• **Robert W. Nairn** "Biogeochemistry of newly created riparian wetlands: evaluation of water quality changes and soil development" Environmental Science Graduate Program (1996)
• **Naiming Wang** "Modelling phosphorus retention in freshwater wetlands" Environmental Science Program (1996)
• **Paul E. Weihe** "Colonizing and introduced vegetation in created riparian wetlands: Establishment during the first two growing seasons" Environmental Science Graduate Program (1996)

*Master's theses (12)*

• **Daniel F. Fink** "Efficacy of a newly created wetland at reducing nutrient loads from agricultural runoff" Master's thesis, Environmental Science Graduate Program (2001)
• **Matthew Cochran** "Effect of hydrology on bottomland hardwood forest productivity in central Ohio (USA). Master's thesis, Natural Resources (2001)
• **Sarah K. Harter** "Patterns of short-term sedimentation in a freshwater created marsh" Natural Resources (1999)
• **Sharon A. Johnson** "Effects of hydrology and plant introduction on first-year macrophyte growth in a newly created wetland" Natural Resources (1998)
• **Lisa J. Svengsouk** "First-year response of *Typha latifolia* L. and *Schoenoplectus tabernaemontani* (K.C. Gmel.) Palla to nitrogen and phosphorus additions in experimental mesocosms" Environmental Science Graduate Program (1998)
• **Kathleen D. Metzger** "Self-design of a fish community in a created riparian freshwater marsh: A simulation model" Environmental Science Graduate Program (1997)
• **John S. Koreny** "Hydrology of a constructed riparian wetland system: Characterization and predictive modeling" Environmental Science Graduate Program (1996)
• **Uygar Özesmi** "A spatial habitat model for the marsh-breeding red-wing blackbird (*Agelaius phoeniceus*) in coastal Lake Erie wetlands" Environmental Science Graduate Program (1996)
• **Doreen M. Dudek** "Tree growth responses to streamflow in a bottomland forest in central Ohio" Natural Resources (1995)
• **Steven F. Niswander** "Functional analysis of a created in-stream mitigation wetland: hydrology, phosphorus retention, and tree growth" Natural Resources (1994)
• **Renée F. Wilson** "Progress and success of five mitigation wetlands in Ohio" Natural Resources (1995)
• **Karen M. Wise** "Evaluation of acid mine drainage control by a constructed wetland in southeastern Ohio" Natural Resources (1994)
• **Frank D. Voss** "Groundwater investigation of Ohio State University wetland site" Geodetic Science (1993)

*Undergraduate honors theses (9)*

• **Katherine E. Kleber** "Fish population and movement within planted and naturally colonizing experimental wetlands, autumn 2000" Natural Resources (2000)
• **Erika A. Filippi** "The role of soil organic matter on denitrification potential in newly created wetlands" Natural Resources (1998)
• **Bonnie F. Elfritz** "A comparison of natural wetlands with a constructed wetland using the Floristic Quality Assessment Index" Natural Resources (1998)
• **Kimberly K. Schamp** "Groundwater patterns before and after wetland construction at the Olentangy River Wetland Research Park" Natural Resources (1997)
• **Nicole L. Vorwerk** "Comparison of three years of pH values between planted and unplanted wetlands at the Olentangy River Wetland Research Park" Natural Resources (1997)
• **Rainie D. Gardner** "Fish recruitment in the Olentangy River constructed wetlands" Natural Resources (1997)
• **Tonya Cheek** "Effect of fish on wetland water quality" Natural Resources (1996)
• **Andrew W. Wehr** "Early water quality of created wetlands at the Olentangy River Wetland Research Park" Natural

Resources (1995)
- **Michael E. Berkal** "Hydrology and water chemistry of the Olentangy River in Worthington (Franklin County), Ohio, and their potential effects on a future constructed wetlands facility downstream in Columbus, Ohio" Natural Resources (1992)
- **Douglas G. Stuart** "Intensive water quality sampling in two constructed riparian wetlands" Natural Resources (1992)

*Theses at other universities (5)*

- **Rikki Bronnum** "The effects of alachlor on denitrifying bacteria in mesocosms and created wetlands in central Ohio, USA" Master's Thesis, Environmental Chemistry, University of Copenhagen (2001)
- **Hojeong Kang** "The significance of enzyme activities in wetland biogeochemistry" University of Wales, UK (1999)
- **Pernille Mortensen** and **Pernille Lanzky** "Water quality improvement in a constructed wetland" Thesis, Royal Danish School of Pharmacy, Copenhagen, DENMARK (1996)
- **Rebecca Smith** "Nitrogen transfer in groundwater in the riparian zone of the Olentangy River, Columbus, Ohio" Thesis, Cambridge University, Cambridge, England, UK (1996)

Table 3. Funded research projects active at the Olentangy River Wetland Research Park in 2001.

| RF # | Short title | Funding Source | College | Amount | end date |
|---|---|---|---|---|---|
| 735542 | Watershed wetland demonstration | Indian Lake Demo Project | FAES | $18,000 | 2/28/01 |
| 738587 | Restoration of a bottomland forest | Ohio Dept Transportation | FAES | $75,000 | 5/1/06 |
| 733487 | A mitigation wetland | Pine Grove, Inc. | FAES | $54,000 | 12/31/01 |
| 736809 | Molecular biodegradation in wetlands | US Department of Agricult. | BIOL SCI | $87,000 | 9/30/01 |
| 738869 | Reuse of clean coal FGD material | Ohio Dept of Development | ENG | $914,000 | 1/31/03 |
| xxxxxx | Reuse of clean coal FGD material (suppl.) | West Virginia University | ENG | $25,000 | 1/31/03 |
| | Center for Wetland and River Restoration | Ohio Board of Regents | FAES | $1,180,000 | 1/31/03 |
| 741196 | Pre-restoration studies of Upper Big Darby | U.S. Army Corps of Eng. | FAES | $68,000 | 9/30/02 |
| | Post-doctoral fellowship-Romi Burks | OSU Graduate School | | $24,000 | 9/30/01 |
| | TOTAL | | | $2,445,000 | |

in 2001. Dozens of organizations in addition to Ohio State have collected data or conducted research at the ORWRP.

## *Research*

Since the wetland project began in 1992 and especially since the two 1-ha basins were flooded on March 4, 1994, dozens of research projects have been initiated on the project by graduate and undergraduate students and post-docs from Ohio State University and elsewhere. Results of those research projects are presented annually in these annual reports.

Over $2.4 million in contracts, grants, and fellowships were active at the ORWRP in 2001 (Table 3). It is likely that much of this funding would not have been awarded if the ORWRP was not present at Ohio State University. The projects included FGD coal combustion product recycling project (Ohio Department of Development, Bill Wolfe, PI), bottomland hardwood forest restoration (Ohio Department of Transportation, Mitsch, PI), and Big Darby Creek restoration (U.S. Army Corps of Engineers, Mitsch and Li, PIs). Two grants totally $1,118,000 from the Ohio Board of regents to partially construct the Wetland Research and Education Building at the Olentangy River Wetland Research Park were also committed during 2001 with the university decision to build the building.

## *Wetland Events*

The ORWRP had several significant activities in 2001. Two major events were associated with development of financial support for the wetland research and education building and the site endowment. A kickoff of a fundraising campaign and a celebration of a $200,000 gift pledge from YSI Foundation were held on February 2, 2001 (Figure 3). Over 100 people attended the event including university officials, the ORW advisory committee, officials from YSI Inc., and other friends of the project.

Groundbreaking for the wetland research and education building was held on May 11, 2001 (Figures 4). The event was attended by 200 participants, and featured addresses by Dean Bobby Moser and President Brit Kirwan and live music by a band from Marietta, Ohio.

## *Moonlight on the Marsh Seminars*

Two Moonlight on the Marsh seminars were held in 2001, one as usual at the ORWRP Sandefur Pavilion on the summer evening and the second in November in Kottman Hall. At the first event on Monday evening August 6, 2001, Robin Lewis, Lewis Environmental Services, Inc., Tampa, Florida, and the world's expert on mangrove swamp restoration, spoke on "So Why Are Shrimp So Cheap These Days?: Mangrove Destruction and Restoration in

Bobby D. Moser, Dean, College of FAES

Ruth Smart, Bill Mitsch, Scott Mueller (Ohio Hist. Society)


Malte von Matthienssen, President, YSI Inc.

Changwoo Ahn (graduate student), Susan Miller (YSI Inc.), Bill Mitsch

YSI officials presenting their $200,000 "check" to Ohio State University for the Wetland Research and Education Building

Figure 3. Photographs taken at the February 2, 2001, funding kickoff event for the Wetland Research and Education Building, Columbus, OH.


Figure 4. Groundbreaking for Wetland Research and Education Building at Ohio State University, May 11, 2001.

Southeast Asia" (Figure 5). The event was attended by 80 participants. As has become the custom, a "Picnic at the Swamp" was held prior to the seminar and a tour of the wetlands was also given to those who were interested.

An opportunity for a second indoor version of the Moonlight on the Marsh, occurred on November 9, 2001 when Major General Hans Van Winkle, Deputy Commander of the U.S. Army Corps of Engineers, visited the campus and gave a presentation entitled "The U.S. Army Corps of Engineers and Wetland Protection and Restoration" (Figure 6). General Van Winkle's presentation focused on the Corps' wetland mitigation policy in light of the recently completed National Academy of Science's report on wetland compensation success and on the Corps' Comprehensive Everglades Restoration Plan, approved by the Congress in the Water Resources Development Act of 2000.

### *Tours, Presentations and Volunteer Efforts*

Conducting formal tours continued to be among the more popular public service contributions of the ORWRP in 2001 (Figure 7). The ORWRP conducted 93 formal tours or public presentations on the Olentangy River Wetland Research Park in 2001 to over 1500 participants (Table 4). One important presentation on the ORWRP for development was at the OSU Winter College event in Naples, FL, on January 27, 2001. Key tours were given to participants of the Biohio event on campus, and to Columbus Recreation & Parks Department, Four Seasons and Northwest Columbus garden clubs, U.S. Army Corps of Engineers, Columbus Foundation, ODNR Division Of Parks & Recreation, Ducks Unlimited, and Ohio Environmental Council. Some of those taking the tour were well-known scientists and engineers including: Mark Hines, The University of Alaska-Anchorage, Robin Lewis, Lewis Environmental, Tampa, FL, Bruce Batt, Ducks Unlimited, Vicky Roberts, University of Portsmouth (UK), Bob Bastian, U.S. Environmental Protection Agency, John W. Day, Louisiana State University, Major General Hans Van Winkle, U.S. Army Corps of Engineers, Washington DC, Debbie Wegner, U.S. Army Corps of Engineers, Huntington District, and Paul Robinson, U.S. Army Corps of Engineers, Cincinnati Ohio River Office.

In collaboration with the local environmental organization FLOW (Friends of Lower Olentangy Watershed), OSU student volunteers, especially newly arriving freshmen, volunteered to help harvest and remove the invasive shrub Amur honeysuckle (*Lonicera maackii*) from the bottomland hardwood forest at the ORWRP as part of its restoration (Figure 8; see also next section). Approximately 40 students and FLOW volunteers participated at the October 18, 2001, event. Ohio Department of Transportation provided the chipper to grind up the woody material and deposit it on "honeysuckle way"—the wood chip path around the experimental wetlands.

### *Bottomland Hardwood Forest Restoration*

The bottomland hardwood restoration, begun in 2000 in collaboration with Ohio Department of Transportation, showed significant results hydrologically in 2001 with both spring and early winter floods (Figure 9). As designed, water flowed into the bottomland when the river rose and flowed out when the river receded. This river connection with its floodplain, restored by cutting holes in an artificial levee between the floodplain and the forest, will ensure successful forest productivity with the pulsing hydroperiod.

### *Tenth Anniversary Symposium*

The year 2001 represented the 10th year since of the start of the Olentangy River Wetland Research Park. A symposium entitled "The Olentangy River Wetland Research Park: Ten Years of Research on Wetland Functions" was held as part of the Society of Wetland Scientists' annual meeting in Chicago, Illinois, on May 31, 2001, to celebrate the occasion. The symposium, which was well attended, involved presentations by over 20 past and present ORWRP researchers from the past 10 years (Figure 10; Table 5).

## Publications

There were 6 peer-reviewed papers, 2 technical reports, and 4 theses/dissertations added to the ORWRP reprint collection in 2001 (Table 6).

## Short Courses

Two short courses were taught in 2001 in the wetland program—*Wetland Delineation* on July 30-August 3, 2001, at the University Plaza Hotel and *Wetland Creation and Restoration*, August 6-8, 2001, at the Holiday Inn on the Lane. The courses attracted a total of 44 students from 11 states: NJ, IL, MA, PA, OH, IN, VA, TN, TX, WV, and MS. Total revenue for the short courses was approximately $39,000 in FY 2001.

## Publicity

The Olentangy River Wetland Research Park was publicized 15 times during 2001 in newspaper articles and university publications (Table 7). Copies of all the articles published on the site in 2001 are given in the Appendix.

## Planning and Development

### *The Master Plan*

Substantial progress has been made on the Olentangy River Wetland Research Park for the past decade. Phase 2 was completed in 1999 and Phase 3, the last phase of site construction shown in the site master plan (Figure 11), calls for construction of a wetland research and education building. Significant progress was made on planning this building project in 2001.

### *Development Support*

The Olentangy River Wetland Research Park has been

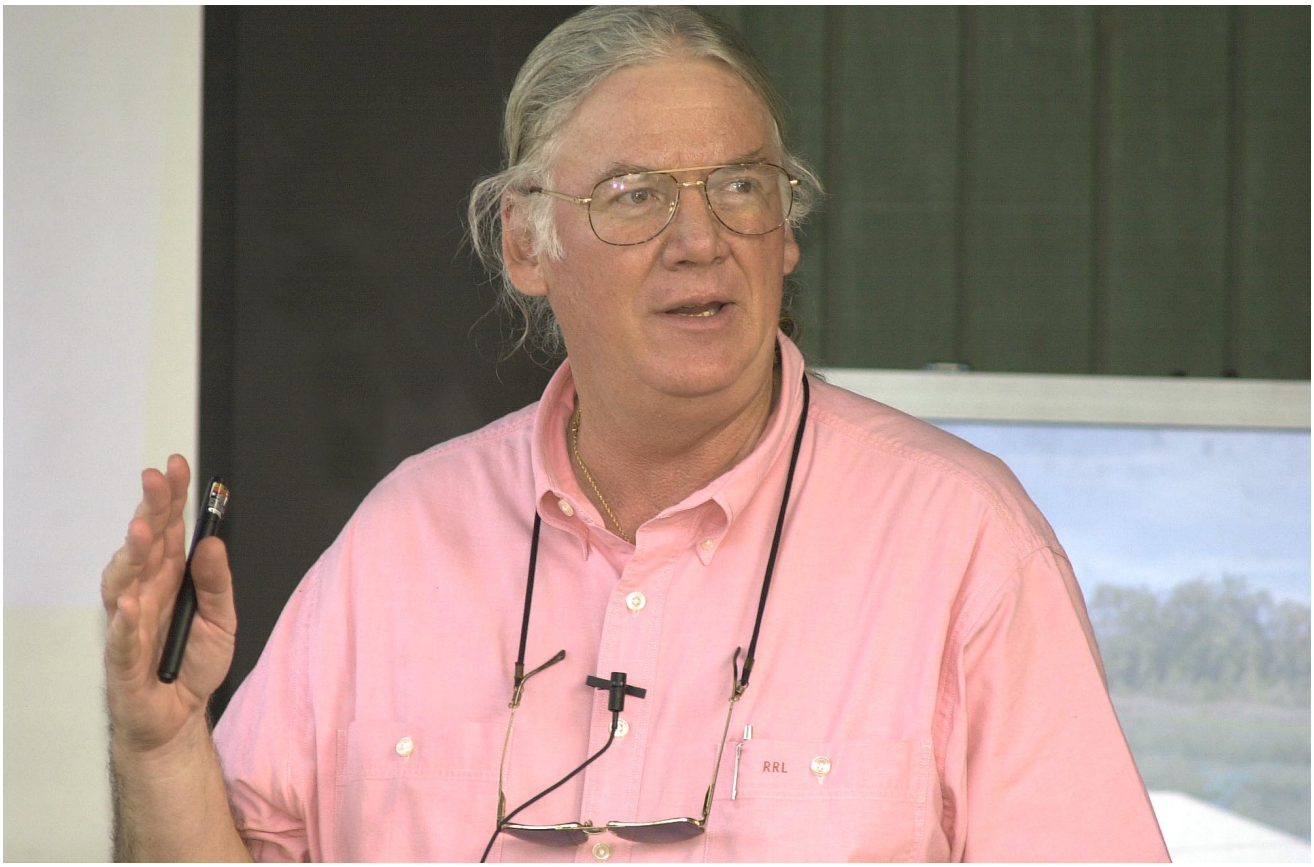


Figure 5. Moonlight on the Marsh lecture by Robin Lewis, Lewis Environmental Inc., Tampa, FL, at the ORWRP, August 6, 2001.


Figure 6. Indoor version of Moonlight on the Marsh lecture by Major General Hans Van Winkle, U.S. Army Corps of Engineers, November 9, 2001. Lecture was held in Kottman Hall on campus. Botttom photo, left to right, Brad Moore, Vice President for Research, General Hans Van Winkle, Jerry Pausch, Chair, ORW advisory committee, Bill Mitsch, ORWRP Director, Gary Mullins, Director, School of Natural Resources.


Figure 7. The ORWRP supported over 90 tours for the public in 2001.

Table 4. Tours, presentations, and visiting scientists of the Olentangy River Wetland Research Park, 2001

| Date | | Organization | Est. # |
|---|---|---|---|
| 1/3/01 | * | Renyoldsburg High School | 3 |
| 1/4/01 | ** | Mark Hines, The University of Alaska-Anchorage | 1 |
| 1/27/01 | | Winter College presentation, Naples, FL | 20 |
| 2/17/01 | * | NR 618 class | 60 |
| 2/28/01 | | Jane Amidon, Visiting professor, LA 633, Plants in Design | 43 |
| 3/15/01 | * | Elayna Grody,Dir; Bob Ames, Asst Dir - City of Col Rec. & Parks | 2 |
| 3/15/01 | * | Lunch and tour, Ruth Smart | 1 |
| 3/16/01 | * | Stewart Diemont (with Jay Martin) | 1 |
| 3/26/01 | * | Rod Tyler | 1 |
| 3/27/01 | * | Ann Cristy, Ag Engr with 15 Worthington High gifted students | 15 |
| 3/31/01 | * | Univ. Fellowship nominees, ESGP | 5 |
| 4/5/01 | * | OARDC Annual Meeting (2 tours) | 50 |
| 4/12/01 | * | Nattan Dale | 1 |
| 4/16/01 | * | Jay Martin's potential grad student Steward Diemont | 2 |
| 4/13/01 | ** | Robert Sinsabaugh, Univ. of Toledo | 1 |
| 4/18/01 | * | Harold Bauman | 1 |
| 4/21/01 | * | Phil Taylor, Jay Gerlach | 2 |
| 4/21/01 | * | Barb Kuch and 15 Logan County teachers | 16 |
| 4/24/01 | * | Prof. Brooks Breeden  Landscape Architecture Classes | 41 |
| 4/27/01 | * | Ann Christy's class - Worthington HS gifted students | 20 |
| 4/25/01 | * | Neilsen Environment | 3 |
| 4/30/01 | * | Jan Dobrowolski's Environmental Ed class | 5 |
| 4/31/01 | * | ESGP University Fellowship  nominees | 10 |
| 5/3/01 | * | Sally Hoffman and Garden Club of America | 15 |
| 5/6/01 | * | Findley Ohio Folks | 4 |
| 5/8/01 | * | Eric Domyan and students | 51 |
| 5/9/01 | * | Leslie Zucker ad Lake Erie Buffer Team | 26 |
| 5/10/01 | * | Adrienne Sokach and students, Biohio | 21 |
| 5/11/01 | | Wetland groundbreaking | 200 |
| 5/12/01 | * | Biohio Tours | 25 |
| 5/12/01 | | Biohio Tours | 25 |
| 5/12/01 | | Biohio Tours | 25 |
| 5/12/01 | | Biohio Tours | 25 |
| 5/14/01 | * | John Cogan and Immaculate Conception First Graders | 4 |
| 5/14/01 | * | CSREES Review | 4 |
| 5/15/01 | * | Ag Engr. Ohio ASAE | 20 |
| 5/16/01 | * | Four Seasons Garden Club and Michael Jackson | 7 |
| 5/17/01 | * | Meagan and Environ Ed Program (2 groups) | 30 |
| 5/22/01 | * | Upper Arlington High School | 17 |
| 5/22/01 | * | Upper Arlington High School | 15 |
| 6/1/01 | * | Jared Nodelman | 1 |
| 6/4/01 | * | Tim Butcher, Col. State | 4 |
| 6/5/01 | * | Molecular Genetics | 5 |
| 6/11/01 | * | Search Committee | 7 |
| 6/11/01 | * | Liberty Bell 4-H Group | 7 |
| 6/14/01 | * | Jay Martin and 4-H girls | 20 |
| 6/14/01 | * | Mark Wildhaber-guest semiar speaker | 2 |
| 6/15/01 | * | Ruth Smart and Martha Wheeler | 3 |
| 6/19/01 | * | Dave and Velma Williams | 2 |
| 6/19/01 | * | Sarah Stovichek | 1 |
| 6/20/01 | * | Advanced Drainage Systems | 3 |
| 7/13/01 | * | Upward Bound Students | 34 |
| 7/17/01 | * | Steve Ford | 2 |
| 7/17/01 | | Richard Farquar, Kalidioscope | 2 |
| 7/18/01 | * | Jane Haas | 1 |
| 7/26/01 | * | Elaine Landwehr and Super Comp Cent OSU | 23 |
| 7/30/01 | * | Wetland Delineation Students | 22 |
| 8/6/01 | * | Short Course Students—Creation/Restoration | 22 |
| 8/6/01 | ** | Moonlight on the Marsh-Robin Lewis | 50 |

| | | | |
|---|---|---|---|
| 8/7/01 | * | Friendship Village | 10 |
| 8/8/01 | * | Northwest Garden Club | 15 |
| 8/12/01 | ** | Bruce Batt, Ducks Unlimited | 3 |
| 8/21/01 | ** | Vicky Roberts-University of Portsmouth | 7 |
| 8/28/01 | * | Friends of Lower Olentangy River Watershed (FLOW) and ODOT | 6 |
| 8/27/01 | * | Church-Garden Group Tour - Carolyn Turner | 10 |
| 9/4/01 | ** | Paul Robinson, Army Corps of Engineers, Cincinnati | 3 |
| 9/4/01 | * | Jennifer Kapfer, Portland State potential student | 1 |
| 9/5/01 | * | Columbus Foundation—Maggie Crutella, Chair, Conservation Committee | 4 |
| 9/5/01 | * | Jay Martin/Tim Granata group | 20 |
| 9/7/01 | * | Miranda Demonstration | 5 |
| 9/10/01 | | Major General Hans Van Winkle-presentation in Washington DC | 30 |
| 9/14/01 | * | Tom Hubbard, OSU | 1 |
| 9/15/01 | * | Matt McClesky & Allison Holm—Radio Interview at wetlands | 2 |
| 9/18/01 | * | Bottomland Restoration with Freshmen Volunteers | 40 |
| 9/18/01 | * | Upper Arlington High School | 30 |
| 9/18/01 | * | Allen Stam, Ecology at Capital Univ. | 4 |
| 9/20/01 | * | Chem 221 Susan Olesik- Honors Chemistry | 16 |
| 9/20/01 | * | Randy Edwards, Ohio Board of Regents | 1 |
| 9/27/01 | * | NR725 Class | 34 |
| 9/29/01 | | NR725 Class | 34 |
| 10/1/01 | | Capital University class presentation | 20 |
| 10/16/01 | | Scotland High School | 10 |
| 10/17/01 | * | Governor's Office Special Assistant on Eng and Ag | 10 |
| 10/18/01 | * | Franklin Heights High School | 30 |
| 10/18/01 | * | Brent Culver and ODNR Division of Parks & Recreation | 10 |
| 10/19/01 | * | Ed Franz and cubscouts | 15 |
| 10/22/01 | * | Russell and birdwatching group | 5 |
| 10/26/01 | * | Kathryn Storm and parents | 3 |
| 11/3/01 | * | Ohio Environmental Council | 40 |
| 11/8/01 | * | Barb Keestor and 2nd Grade class | 30 |
| 11/9/01 | ** | Bob Bastian, U.S. Environmental Protection Ageny | 1 |
| 11/9/01 | ** | John W. Day, Louisiana State University | 1 |
| 11/9/01 | ** | Major Gen. Hans Van Winkle, U.S. Army Corps of Engineers | 30 |
| 12/12/01 | ** | Debble Wegner, U.S. Army Corps of Engineers, Huntington District | 2 |
| | | TOTAL IN TOURS | 1511 |
| | | # of Tours/Presentations | 93 |

*site tour
**site tour with visiting scientist or distinguished visitor

Figure 8. OSU student volunteers who assisted with botttomland hardwood forest restoration on September 18, 2001. Event was co-sponsored by FLOW (Friends of Lower Olentangy Watershed) and ORWRP.


Figure 9. Flooding events in April and December 2001 in the bottomland hardwood forest restoration project as a result of the Ohio Department of Transportation river reflooding mitigation project. Cuts in levee were made in spring 2000 and these were among the first floods that occurred in the bottomland.

Figure 10. Participants in the symposium "The Olentangy River Wetland Research Park: Ten Years of Research on Wetland Functions" held as part of the Society of Wetland Scientists' Annual Meeting in Chicago, May 31, 2001. Front row: Changwoo Ahn, Ph.D. 2001; Romi Burks, post-doc 2000-01; Brian Reeder, Ph.D. 1991, Amie Gifford, M.S. 2002, Siobhan Fennessy, M.S., 1998, Ph.D., 1991; second row: Li Zhang, post-doc, 2000-2001, Sharon Johnson, M.S. 1998, Marshall Eames, Ph.D. Univ of Illinois at Chicago 1998, John Gutrich, Ph.D., 2000, Deni Porej, Ph.D. 2004, Doug Spieles, Ph.D. 1998, Bob Nairn, Ph.D. 1996, Karen Wise, M.S. 1995, Katie Kleber, B.S. 2000, Cheri Higgins, M.S. 2002, Ben Wu, post-doc 1993-95, Bill Mitsch. All had formal connectiions to the Ohio State University wetland program.

Table 5. Symposium program "The Olentangy River Wetland Research Park: Ten Years of Research on Wetland Functions" held at the Annual Meeting of the Society of Wetland Scientists, Chicago, IL, May 31, 2001.

| Time | Title | Authors/Speaker |
|---|---|---|
| 9:10 am | Diversity or horsepower? A whole-ecosystem, long-term wetland experiment illustrates surprising effects of community diversity on ecosystem function | William J. Mitsch<br>Ohio State University |
| 9:40 | Early soil development in created riparian wetlands | Robert W. Nairn,<br>University of Oklahoma |
| 10:00 | Water column productivity, calcite precipitation, and phosphorus dynamics in two created wetlands at the Olentangy River Wetland Research Park, Columbus, Ohio | Michael A Liptak<br>ASC Group, Inc., Columbus |
| 10:20 | Break | |
| 10:40 | Plant establishment along gradients in the planted and unplanted experimental wetlands at the Olentangy River Wetland Research Park | Virginie Bouchard and<br>William J. Mitsch<br>Ohio State University |
| 11:00 | Spatial pattern of algal development in newly created riparian wetlands | X. Ben Wu, Texas A&M,<br>John A. Kantz, Jr., Robert Deal, Shawnee State Univ. |
| 11:20 | Ohio State Wetlanders Lunch at Berghoff's | |

Table 5, continued

| | | |
|---|---|---|
| 1:20 pm | Macroinvertebrate community structure in high and low nutrient constructed wetlands | Douglas J. Spieles, Southwest Minnesota State |
| 1:40 | Fish and tadpole use of planted and naturally colonized wetlands | Katharine E. Kleber, David L. Johnson, Amie M. Gifford, Ohio State University |
| 2:00 | The effects of muskrat activity on created wetlands with different spatial diversity | Cheri R. Higgins Ohio State University |
| 2:20 | Break | |
| 2:40 | Effects of hydroperiod on initial wetland plant community composition, diversity,density and biomass production: A mesocosm study | Sharon A. Johnson, Michigan State University |
| 3:00 | Dynamics of mixtures of *Typha latifolia* and *Schoenoplectus tabernaemontani* in nutrient-enrichment wetland experiments | Lisa J. Svengsouk, William J. Mitsch, Ohio State University |
| 3:20 | Modelling of hydrological budgets of experimental flow-through wetlands | Li Zhang Ohio State University |
| 3:40 | An ecologic-economic modeling approach for evaluating the use of a recycled coal combustion product in constructed wetlands | Changwoo Ahn Ohio State University |
| 4:00 | An ecological-economic analysis of wetlands: Estimating economic time lag costs of wetland mitigation | John Gutrich, Fred Hitzhusen Ohio State University Siobhan Fennessy, Kenyon College |

Table 6. Publications of the Olentangy River Wetland Research Park in 2001

*Papers*

01-006 Mitsch, W.J., N. Wang, and V. Bouchard. 2000. Fringe wetlands of the Laurentian Great lakes: Effects of dikes, water level fluctuations, and climate change. *Verh. Internat. Verein. Limnol.* 27: 3430-3437.

01-005 Mitsch, W.J., J. W. Day, Jr., J. W. Gilliam, P. M. Groffman, D. L. Hey, G. W. Randall, and N. Wang. 2001. Reducing nitrogen loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to counter a persistent large-scale ecological problem. *BioScience* 51: 373-388.

01-004 Fennessy, M.S. and W.J. Mitsch. 2001. Effects of hydrology on spatial patterns of soil development in created riparian wetlands. *Wetlands Ecology and Management* 9: 103-120.

01-003 Ahn, C. and W.J. Mitsch. 2001. Chemical analysis of soil and leachate from experimental wetland mesocosms lined with coal combustion products. *Journal of Environmental Quality* 30: 1457-1463.

01-002 Svengsouk, L. and W.J. Mitsch. 2001. Dynamics of mixtures of Typha latifolia and Schoenoplectus tabernaemontani in nutrient-enrichment wetland experiments. *American Midland Naturalist* 145: 309-324.

01-001 Ahn, C., W.J. Mitsch, and W.E. Wolfe. 2001. Effects of recycled FGD liner material on water quality and macrophytes of constructed wetlands: A mesocosm experiment. *Water Research* 35: 633-642.

*Theses/Dissertations*

Ahn, C. 2001. Ecological engineering of wetlands with a recycled coal combustion byprooduct. Ph.D. dissertation, Environmental Science Graduate Program, The Ohio State University

Fink, D.F. 2001. Efficacy of a newly created wetland at reducing nutrient loads from agricultural runoff. Master's thesis, Environmental Science Graduate Program, The Ohio State University

Cochran, M. 2001. Effect of hydrology on bottomland hardwood forest productivity in central Ohio (USA). Master's thesis, Natural Resources, The Ohio State University

Bronnum, R. 2001. The effects of alachlor on denitrifying bacteria in mesocosms and created wetlands in central Ohio, USA. Master's Thesis, Environmental Chemistry, University of Copenhagen

*Technical Reports*

T-01-02 Mitsch, W.J. and L. Zhang, eds. 2001. Olentangy River Wetland Research Park at The Ohio State University, Annual Report 2000, School of Natural Resources, The Ohio State University, 216 pp.

T-01-01 Mitsch, W.J. and D.F. Fink. 2001. Wetlands for controlling nonpoint source pollution from agriculture: Indian Lake Wetland Demonstration Project. Submitted to Indian Lake Watershed Project, Bellfontaine, OH, 18 pp.

Table 7. Press and media coverage of the Olentangy River Wetland Research Park, 2001.

| Date | Article Title or Event | Publication |
|---|---|---|
| January 19, 2001 | “Wired Wild Wetlands” | Columbus Business First April |
| 17, 2001 | “Walk a Wetland without getting Wet, at BioHio” | BioHio an Open House |
| May 14, 2001 | “Construction Begins on Wetland Facility” | The Lantern |
| Spring/Summer 2001 | “Groundbreaking for Wetland Research and Education Building” | Giving Update-OSU |
| May 16, 2001 | “Wetland Research and Education Building Breaks Ground” | Development NewsletterFAEC |
| June, 2001 | “Education and Industry Collaborate for Wetland Preservation and Restoration” | Society of Wetland Scientist Bulletin |
| June, 2001 | "From Bugs to Wetlands, the College Hosts its First BioHio in Columbus" | enVision |
| June 18, 2001 | “Naming rights at OSU come in all sizes” | The Columbus Dispatch July |
| 19, 2001 | “OSU wetland’s facility relocates and upgrades” | The Lantern |
| July 24, 2001 | “Muddy Waters: Letting the Gulf of Mexico Breathe Again” | Research News-OSU |
| July 24, 2001 | “Wetland Loss still Outweighs Gain despite 20 Years of Progress” | Research News-OSU |
| September, 2001 | “Plan to Reduce ‘Dead Zone’ Will Cost $1 Billion Annually” | Civil Engineering |
| October 2001 | “Nature’s Living Laboratory” | Ohio State Alumni Magazine |
| November 10, 2001 | "Corps' plan for wetlands angers critics" | The Columbus Dispatch |
| November 21, 2001 | "Wetland Research" | on CAMPUS |
| Radio | | |
| May 10, 2001 | BioHio Event | WRFD radio |
| May 10, 2001 | Discussion on Wetlands - Tom Wiebel Show | WOSU radio |

Table 8. Donation support for the Olentangy River Wetland Research Park through 2001.

| Year | Number of donations | Total amount of donations | In-kind donations* | Endowment donations | General cash donations** | Building fund |
|---|---|---|---|---|---|---|
| 2001 | 309 | $247,891 | $75,000 | $1,140 | $9,459 | $162,292 |
| 2000 | 250 | $237,077 | $31,300 | $97,620 | $22,129 | $86,028 |
| 1999 | 165 | $115,626 | $3,705 | $94,000 | $6,782 | $11,138 |
| 1998 | 149 | $98,839 | $23,624 | $4,415 | $63,360 | $7439 |
| 1997 | 168 | $78,228 | $13,503 | $300 | $61,215 | $3,213 |
| 1996 | 146 | $221,889 | $187,78 | $4,000 | $30,105 | |
| 1995 | 108 | $97,184 | $36,516 | $11,000 | $49,668 | |
| 1994 | 86 | $62,686 | $48,744 | | $13,942 | |
| 1993 | 46 | $259,206 | $21,215 | | $237,991 | |
| 1992 | 7 | $59,347 | $6,327 | | $53,020 | |
| TOTAL | 1435 | $1,477,971 | $441,067 | $212,475 | $554,320 | $270,108 |

* In-kind includes construction of 7-acre billabong in 1996 ($170,000) and donation of 5 acres of bottomland forest in 2001 ($75,000).
** Includes construction of wetlands in 1992-95 ($330,000) and Sandefur Wetland Pavilion in 1997-98 ($100,000)

supported in its first decade (1991-2001) principally through private donations to the University. Through December 2001, the equivalent of over $1,480,000 has been raised for the wetland project (Table 8), almost all from corporations and individuals. In 2001, there were 309 identifiable donations totalling $248,000, an increase from 250 donations totalling $237,000 in 2000. About one-third of the donation amount received since 1992 has been as in-kind contributions such as the billabong construction, boardwalk material, and two 4-wheel-drive vehicles. In 2001, approximately $162,000 (65% of the total donations for 2001) received were for the Wetland Research and Education Building.

A major in-kind gift to the University in 2001 obtained by the ORWRP was the donation of 4.9 acres of bottomland forest on the southeastern corner of the ORWRP adjacent to the Olentangy River. The gift was from Olentangy Cover Associates, Ltd., Columbus, OH. The value of that land was appraised as $75,000. Other in-kind support obtained over the 10 years includes two four-wheel drive vehicles and construction of the billabong wetland.

### *Research and Education Building*

The Wetland Research and Education Building (Figure 12) is currently (2002) being constructed on the site. It will allow researchers to take full advantage of the campus wetlands and to relieve overcrowded labs, offices, and


Figure 11. Master plan for the Olentangy River Wetland Research Park.

Figure 12. Architect's sketch of wetland research and education building being constructed at Olentangy River Wetland Research Park.

research facilities on campus. The floor plan (Figure 13) includes a state-of-the-art control room, or "operations theater," where physical, chemical, and biological data in the wetland can be monitored in real time by staff wetland scientists. Some of those data will be displayed in the adjacent lobby (Figure 14) designed as a starting point for wetland site tours. The building design also include a conference center for continuing education-type courses of wetlands that up to this point have been taught in local hotels that charged meeting room fees. The building will also include faculty and student offices, wet-laboratories for water analysis, a soil-water-plant analysis prep room (mud room), a computer laboratory, and a wetland library.

The cost of the building after bids was determined to be $2.5 million (Table 9). By the end of 2001, a total of $1,750,000 had been raised for the building, including grants from the Ohio Board of Regents, development funds, and support from OARDC. A $330,000 loan from OARDC brought the total to $2,080,000. This amount was sufficient to start construction, without FFE, in 2002. Furnishings and Equipment (FFE) will be obtained as funds become available and the loan will be repaid as well.

Table 9. Cost of wetland research and education building

| | |
|---|---|
| Construction Costs* | $1,639,535 |
| Movable Furnishings and Equipment (FFE) | 500,000 |
| Contingency | 163,953 |
| Design Fees | 155,325 |
| University Administration Fee | 19,674 |
| Utilities | 60,000 |
| **Total Project Cost** | **$2,538,487** |

* Based on low bids of December 13, 2001, which were subsequently accepted by University

### *Wetland Endowment*

In addition to capital costs, the building, the ecosystems, and site infrastructure at the ORWRP will require continued operational expenses. A goal of $1.5 million was established for an endowment to maintain this campus wetland area in perpetuity. By the end of 2001, over $200,000 had been raised in endowments for the site in two endowment accounts. One endowment account is for building support. The other account, provided by the Heffner family, includes support for the undergraduate site engineer who maintains the ORWRP site.

## ORWRP's 10-Year Impact at OSU

Through 2001, the economic and academic impact of the ORWRP on Ohio State University and the world of wetland science has been significant. Over its 10-year period of development and operation, the ORWRP has resulted in the following economic advantages to the University:

| | |
|---|---|
| Wetland Short Course Income | $100,000 |
| Extramural Grants and Contracts | $2,500,000 |
| Donations | $1,450,000 |
| Total impact | $4,050,000 |

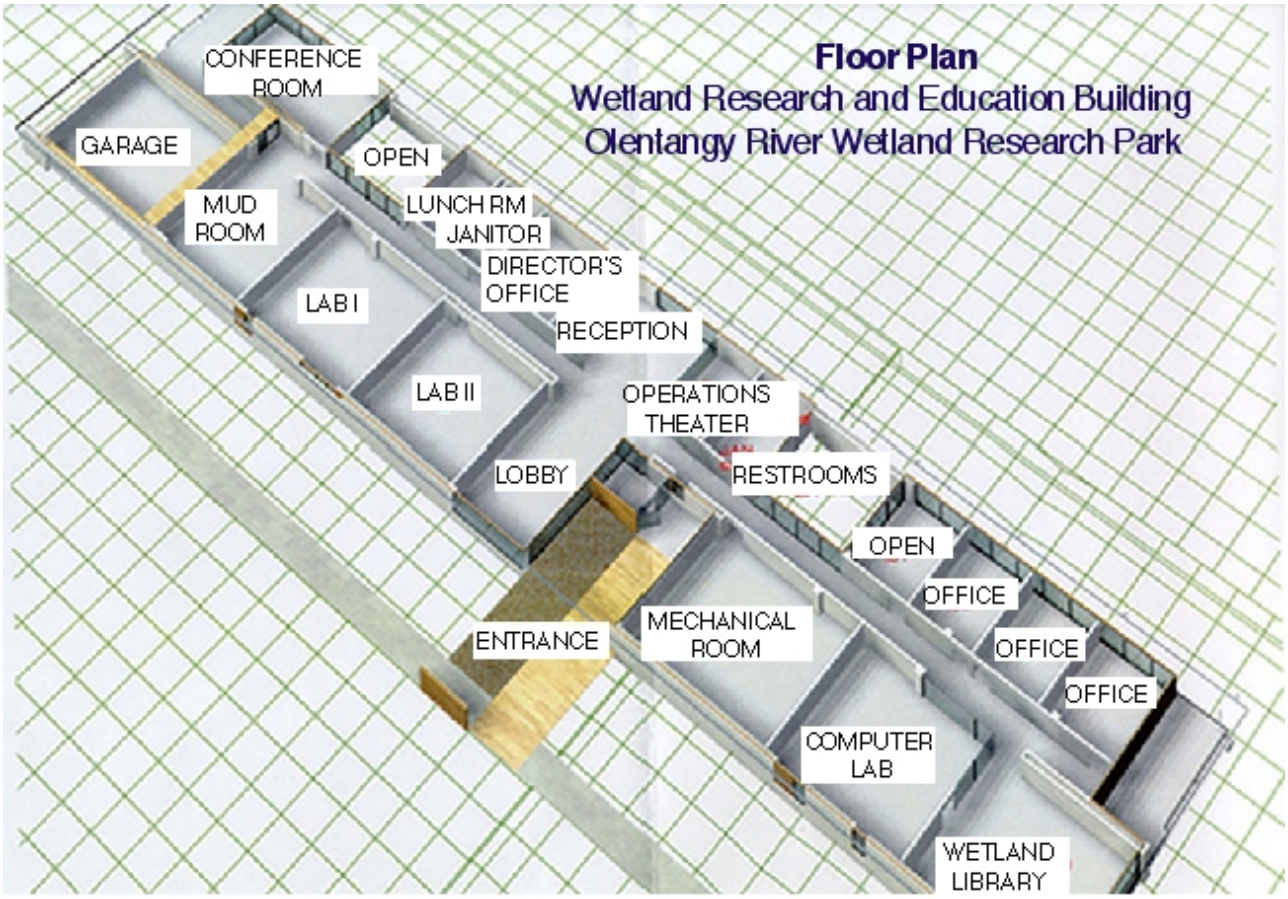


Figure 13. Floor plan of wetland research and education building.

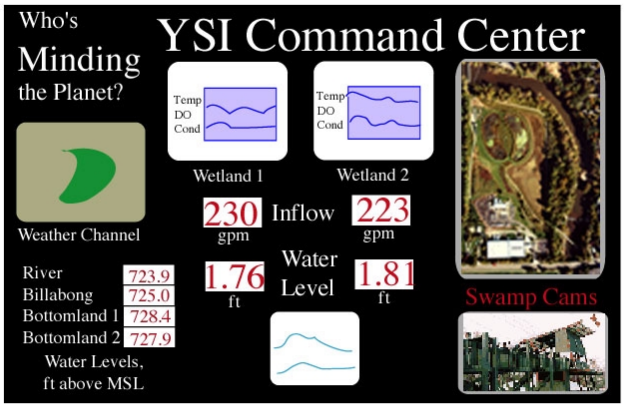


Figure 14. Suggested schematic of lobby data display in the wetland research and education building.

Over the period 1992-2001, the project has also been responsible for the following academic achievements:

• completion of 35 undergraduate and graduate student theses and dissertations at OSU and in Europe,

• publication of 99 papers listed in the ORWRP reprint series,

• completion of 10 comprehensive annual reports of all research accomplished at the site,

• leadership of over 600 formal wetland tours and presentations for the public to an estimated 15,000 individuals including K-12 students, university students, garden clubs, campus visitors, and Federal, state, and local public officials.

• provision of a convenient set of campus ecosystems in support of an estimated 100 Ohio State University classes in 5 university colleges.

• provision of a controlled research site for dozens of students doing independent research. This has supported the research programs of more than 20 professors.

• education of 150 agency personnel and consultants in 10 wetland short courses taught since 1996.

## References

Mitsch, W.J., J. W. Day, Jr., J. W. Gilliam, P. M. Groffman, D. L. Hey, G. W. Randall, and N. Wang. 2001. Reducing nitrogen loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to counter a persistent large-scale ecological problem. *BioScience* 51: 373-388.